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Composition of Volatile Flavor Compounds of Vaname Shrimp Meat and Vaname Shrimp Waste*(Litopenaeus vannamei)*

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ABSTRACT
The flavor is a sensation that arises because of the volatile or non-volatile chemical components, which are natural or synthetic, and arise when eating or drinking. Volatile components are components that give a sensation of odor and evaporate very quickly while non-volatile components give sensation to tastes like sweet, bitter, sour and salty, do not give a sensation of odor but are a medium for volatile components, and help resist the evaporation of volatile components.The research method carried out is an experimental method, by testing the composition of volatile flavor compounds and testing proximate to meat broth and vaname shrimp waste. Samples of vaname meat broth and vaname shrimp waste broth were extracted for their volatile flavor compounds by the solid-phase microextraction (SPME) method to identify volatile flavor compounds using the Gas Chromatography-Mass Spectrometry (GC / MS) tool. Most of the volatile flavor compounds detected in both samples came from hydrocarbons, aldehydes, ketones, alcohols, organic compounds, and others. In the sample of vaname shrimp boiled water, the detected compounds were 111 compounds and in the sample of boiled water vaname shrimp waste were detected as many as 88 compounds. The compounds that had the largest proportion in both samples were compounds of the 1,4-di-iso-propylnaphthalenee hydrocarbon group 13,648% for vaname shrimp meat broth and dimethylspiro [4.5] decane 33.613% for vaname shrimp waste broth.

Keywords**:** *Shrimp, Vaname, broth, volatile flavor compounds, proximate*

1. INTRODUCTION

Vaname shrimp is one of the fisheries products that are in great demand by the community, has a distinctive aroma and has a high nutritional value. If the fresh shrimp is processed to be frozen, then 35-70% of the total weight will become shrimp waste in the form of heads, skins, and shrimp that are not suitable for consumption (Animal Feed Management Information System 2000). The composition of the utilization of shrimp parts consists of heads weighing approximately 36-49% of the total body weight, skin 7-23% and meat 24-41% (Arpah 1993). The utilization of shrimp waste reaches 44% of the total weight of all shrimp (Mirzah et al 1997).

The utilization of shrimp waste is still limited to making shrimp paste, crackers, and animal feed mixtures. According to Susti (2009) when food is served flavor is one of the factors taken into account by consumers and broth is one type of flavor that is added to processed food products daily (Susti 2009). Shrimp waste which is made into broth has a strong and distinctive aroma so it is possible to become a natural flavor.

One of the formations of flavor from food is through processing or storage. Heating is the process of forming flavor through the processing. Boiling is the cooking process in 100^{o}C boiling water, where water is a medium for conducting heat. Stirring is used to prepare most of the homemade dishes in China, while boiling is used on a type of food that is common in western societies, whereas (Liu et al 2008). The boiling process is a way of making one of the foods that are usually added to cooking, namely broth.

Broth is interpreted as boiled water of animal food ingredients cooked in a certain time, by adding vegetables, as an aroma enhancer. The broth has several uses including stimulating the digestive tract so that it causes appetite, as a basis for making soups and sauces and as a flavoring to which certain dishes can be added (Djelantik 1999).

The flavor is a sensation that arises because of the volatile or non-volatile chemical components, which are natural or synthetic, and arise when eating or drinking. Volatile components are components that give a sensation of odor and evaporate very quickly while non-volatile components give sensation to tastes like sweet, bitter, sour and salty, do not give a sensation of odor but are a medium for volatile components, and help resist the evaporation of volatile components. Volatile flavor has volatile properties and therefore product handling is important to note and influences the product's aroma characteristics (Pratama et al 2017).

Research on the identification of volatile flavor compounds has been widely carried out on agricultural commodities but is still rarely found for fisheries commodities. Research Liu et al. (2009) regarding the effect of recooking on volatile and non-volatile compounds found in silver carp, the study of Guillen and Errecalde (2002) with fresh and steamed fish meat samples with fresh and steamed treatment, Chung et al. (2002) regarding the analysis of volatile components in frozen and dry scallops (Patinopecten yessoensis).

2. RESEARCH METHOD

2.1 Samples preparation

Samples arrived at the Padjadjaran University Fisheries Product Processing Laboratory. Shrimp vaname cleaned and then taken the meat, head, and shell. The parts are then divided again in part to be boiled and made into stock (cooking water for meat and vaname shrimp waste). Vaname shrimp meat and waste (head and shell) are boiled for 90 minutes at 65^{o}C (low heat) using distilled water (water: sample ratio is 2: 1) (Damuringrum 2002) conducted at the Fisheries Processing Laboratory using stainless steel pans. The broth that has finished boiling is then cooled, filtered and packed in glass bottles after measuring the volume. Samples of beef broth and vaname shrimp waste are put into different glass jar and tightly closed. The broth sample is put into a glass jar with a tightly closed lid using cling wrap and aluminum foil. Samples after being tightly packed are then put into coolboxes containing ice with low/cool temperatures to be transported to the Rare Animal Conservation Laboratory and the Integrated Laboratory Hope, Bogor Agricultural University for Proximate Analysis and Flavor Laboratory for the Indonesian Center for Rice Research, Sukamandi, Subang for analysis flavor compound.

2.2 Proximates analysis

Samples of meat broth and vaname shrimp waste are then analyzed for water, ash, protein and lipid content. Proximate analysis is carried out according to the standards of the Official Analytical Chemistry Association (2005). Moisture is determined gravimetrically after drying the sample completely in the oven at 1100C. The determination of total inorganic content (% ash) is carried out by burning organic material in a muffle furnace for 24 hours at 450^{o}C. The total protein content was determined by the Kjeldahl method and calculated as% nitrogen x 6.25. The total lipid content was determined using the Soxhlet system by drying the sample in an oven (105^{o}C) and refluxed for 8 hours using 150 ml of chloroform in a Soxhlet tube and the results are expressed in%.

2.3 Volatiles compound analysis

The volatile components of meat broth and vaname shrimp waste are analyzed according to the modified Fan procedure (2017). Analyzes were performed using water baths for sample extraction and Gas Chromatography (GC) (Agilent Technologies 7890A GC System) and Mass Spectrometry (MS) (Agilent Technologies 5975C Inert XL EI CI / MSD) devices to detect and identify volatile components. The sample extraction method was carried out with Headspace Solid Phase Micro Extraction (HS / SPME) using DVB / Carboxen / Poly Dimethyl Siloxane fiber. The extraction time of the sample used in the water bath was 45oC for 45 minutes. The GC column used was DB-5 (60 mx 0.25 mm x 0.25 mm) with a helium carrier gas. The initial running temperature is 45oC (hold 5 minutes) with escalation of 5oC / minute. The final device temperature is 250oC (hold 5 minutes) with an overall operating time of 36 minutes.

2.4 Data analysis

Samples volatile components mass spectrums which were detected from GC/MS were then compared with the mass spectrum pattern (available in computer database or NIST (National Institute of Standard and Technology) library 0.8L version). The resulting data were further analyzed with Automatic Mass Spectral Deconvolution and Identification System (AMDIS) software (Mallard et al. 1997). The data produced from the volatile compound analysis were discussed descriptively based on the identification and the semi quantification intensity of the compounds detected from the analyzed samples.

3. Result and discussion

3.1 The results of the analysis of the volatile broth compound vaname shrimp meat.

Volatile compounds identified consisted of various groups of compounds, namely hydrocarbon group (33 types), which was the largest group of compounds detected with 1,4-di-iso-propylnaphthalene (13,648%) and 1,7-di-iso-propylnaphthalene (13,648) %) as the type of compound which has the highest proportion. The other groups detected were 17 types of aldehyde compounds with Heptadecanal (13,648%) had the highest proportion, 13 types of ketones with β-iso-Methyl ionone (13,646%) had the highest proportion, 11 types of alcohol with (S) - (() +) - 6-Methyl-1-octanol (1.507%) has the highest proportion. In addition to these groups, 2 types of nonahexacontanoic acid (0.555%) were identified with the highest proportion, 2 types of Oxalic acid ester compounds, bis (6-ethyloct-3-yl) esters (13.664%) and 31 types of other compounds Epicedrol (13.645%).

Table 1. Volatile Compounds Detected in Shrimp Meat Broth Vaname

Golongan	RT(min)	Senyawa	Area	Proporsi

Golongan	RT(min)	Senyawa	Area	Proporsi
Hidrokarbon	27.5997	1,7-di-iso-propylnaphthalene	1000374061	13.648
	28.5273	1,4-di-iso-propylnaphthalene	1000374057	13.648
	22.6824	Cyclopropane, nonyl-	74663857	1.019
	16.3499	Cyclopentane, 1-pentyl-2-propyl-	62199513	0.849
	28.0754	Heptadecane, 2,6-dimethyl-	54105678	0.738
	19.6083	Tridecane, 4-methyl-	26730121	0.365
	16.9743	2,6-Octadiene-1,8-diol, 2,6-dimethyl-	26489178	0.361
	28.2478	Naphthalene, 1,2,3-trimethyl-4-propenyl-, (E)-	26137531	0.357
	27.4927	2,6-Diisopropylnaphthalene	24157811	0.330
	28.4381	2,6-Diisopropylnaphthalene	24157811	0.330
	29.2586	trans-1,2-Diphenylcyclobutane	20071094	0.274
	15.678	Undecane, 2,6-dimethyl-	17301234	0.236
	13.3888	2-Hexene, 3-methyl-, (Z)-	10574364	0.144
	17.4202	1-Methyl-2-methylenecyclohexane	2808755	0.038
	12.7586	Octane, 4-methyl-	2216344	0.030
	13.151	4-Nonene	2198234	0.030
	12.9429	Cyclohexane, 1,2,3-trimethyl-	1678973	0.023
	15.9099	Cyclohexene, 1,2-dimethyl-	1674108	0.023
	12.2532	Cyclopentane, ethyl-	1640897	0.022
	19.7748	Tridecane, 2-methyl-	1560969	0.021
	22.2781	Undecane	1120214	0.015
	13.4959	Cyclopropane, 1,1-diethyl-	1003196	0.014
	24.1986	Hentriacontane	630046	0.009
	29.443	Hentriacontane	630046	0.009

Golongan	RT(min)	Senyawa	Area	Proporsi
	30.0019	Nonadecane	629925	0.009
	27.8613	Heptadecane	629787	0.009
	23.2175	Pentadecane	629629	0.009
	20.7202	Tetradecane	629594	0.009
	18.0862	Tridecane	629505	0.009
	28.8722	Octadecane	593453	0.008
	20.5597	Cyclotetradecane	295170	0.004
	27.4154	Cyclotetradecane	295170	0.004
	14.5959	1-Nonene	124118	0.002
	15.2321	Dodecane	112403	0.002
	14.9942	Naphthalene	91203	0.001
Alkohol	13.7872	(S)-(+)-6-Methyl-1-octanol	110453786	1.507
	13.7872	(S)-(+)-6-Methyl-1-octanol	110453786	1.507
	14.3937	1-Pentanol, 2,4,4-trimethyl-	16325636	0.223
	23.5446	1-Dodecanol, 2-octyl-	5333426	0.073
	6.6164	2-Methylenecyclohexanol	4065809	0.055
	9.0602	1-Octen-3-ol	3391864	0.046
	24.5851	Ethanol, 2-(octadecyloxy)-	2136723	0.029
	24.4781	1-Octanol, 2-butyl-	735273	0.010
	6.1585	1-Hexanol	111273	0.002
	10.4575	1-Hexanol, 2-ethyl-	104767	0.001
	25.7981	Benzenemethanol, 3,4-dimethoxy-	93038	0.001
Aldehid	32.4813	Heptadecanal	1000376700	13.648
	18.5559	2,4-Decadienal, (E,E)-	25152845	0.343
	21.8797	2,6-Dodecadien-1-al	21662135	0.296
	14.2213	2-Nonenal, (E)-	18829566	0.257
	17.1229	2-Decenal, (E)-	3913813	0.053
	11.2661	2-Octenal, (E)-	2548870	0.035
	1.7704	Butanal, 3-methyl-	590863	0.008
	9.9402	2,4-Heptadienal, (E,E)-	354313	0.005
	30.4122	Tetradecanal	124254	0.002
	12.5861	Nonanal	124196	0.002
	10.9034	Benzeneacetaldehyde	122781	0.002
	15.5175	Decanal	112312	0.002

Golongan	RT(min)	Senyawa	Area	Proporsi
	29.1338	Heptanal	111717	0.002
	2.6801	Pentanal	110623	0.002
	29.0565	Octanal, 2-(phenylmethylene)-	101860	0.001
	8.5191	Benzaldehyde	100527	0.001
	4.5769	Hexanal	66251	0.001
Keton	27.2489	β-iso-Methyl ionone	1000285402	13.646
	20.857	Bicyclo[3.2.1]oct-3-en-2-one, 4-methyl-	62702890	0.855
	19.3705	1-(2-Pyrazinyl)butanone	61892817	0.844
	12.4137	3,5-Octadien-2-one, (E,E)-	30086023	0.410
	21.4932	Tetrahydro[2,2']bifuranyl-5-one	19680003	0.268
	22.5575	Cyclohexanone, 2-ethyl-	4423943	0.060
	22.1294	trans-Geranylacetone	3796701	0.052
	11.6942	Ethanone, 1-(1H-pyrrol-2-yl)-	1072839	0.015
	27.7365	1-(4-Benzylphenyl)ethanone	782923	0.011
	9.191	2,3-Octanedione	585251	0.008
	16.6116	2,3-Octanedione	585251	0.008
	26.5056	Benzophenone	119619	0.002
	17.9732	2-Undecanone	112129	0.002
Organik	24.8646	Nonahexacontanoic acid	40710325	0.555
	17.551	Nonanoic acid	112050	0.002
Ester	28.9673	Oxalic acid, bis(6-ethyloct-3-yl) ester	1000309346	13.647
	32.6062	Hexadecanoic acid, methyl ester	112390	0.002
Senyawa	26.3035	Epicedrol	1000156228	13.645
la**in-lain**	16.8137	2-Isoamyl-6-methylpyrazine	91010412	1.242
	18.9067	2-Oxo-1-methyl-3-isopropylpyrazine	78210681	1.067
	16.2667	4,8-Decadien-3-ol, 5,9-dimethyl-	67845549	0.926

Golongan	RT(min)	Senyawa	Area	Proporsi
	19.0256	Pyrethrone	22610793	0.308
	25.0429	1,11-Dodecadiyne	20521442	0.280
	31.5359	1-Butyl 2-isobutyl phthalate	17851535	0.244
	26.6305	3-Hydroxypyridine monoacetate	17747432	0.242
	10.178	Pyrazine, 2-ethenyl-6-methyl-	13925092	0.190
	25.9586	2-(5-Aminohexyl)furan	13748113	0.188
	11.9024	Pyrazine, 3-ethyl-2,5-dimethyl-	13360651	0.182
	19.8521	1,3-Propanediamine, N-methyl-	6291845	0.086
	7.205	Pyrazine, 2,3-dimethyl-	5910894	0.081
	9.2921	Furan, 2-pentyl-	3777693	0.052
	27.0527	1,1'-Biphenyl, 2,2',5,5'-tetramethyl-	3075841	0.042
	14.691	Levomenthol	2216515	0.030
	21.6121	3,3'-Bis(1,2,4-oxadiazolyl)-5,5'-diamine	2091903	0.029
	20.191	Benzimidazole, 2-amino-1-methyl-	1622577	0.022
	31.2862	Galoxolide	1222055	0.017
	7.4369	1H-Pyrrole, 1-ethyl-	617925	0.008
	28.6462	Phenol, 4-(1-methyl-1-phenylethyl)-	599644	0.008
	18.3418	2-Acetylaniline	551939	0.008
	30.2873	2-Ethylhexyl salicylate	118605	0.002
	30.5667	Isopropyl myristate	110270	0.002
	3.7861	Pyrrole	109977	0.002
	23.7467	2,4-Di-tert-butylphenol	96764	0.001
	24.044	Acetyleugenol	93287	0.001
	17.7175	Benzenamine, N,N-diethyl-3-methyl-	91678	0.001
	21.4159	Caryophyllene	87445	0.001
	33.4089	Butyl 2-ethylhexyl phthalate	85698	0.001
	25.6375	Diethyl Phthalate	84662	0.001

RT : *Retention Time* (minutes)

3.1.1 The results of the analysis of the volatile broth compound vaname shrimp waste.

Volatile compounds identified consisted of various groups of compounds namely 35 hydrocarbon groups, the highest class of compounds identified were dimethylspiro [4.5] decane (33.613%), 14 types of aldehyde compounds with Heptadecanal (33.662%) had the highest proportion, 11 types of ketones with Bicyclo [3.2.1] oct-3-en-2-one, 4-methyl- (2,107%) has the highest proportion, 8 types of alcohol with (S) - (+) - 6-Methyl-1-octanol (3,712 %) has the highest proportion. In addition to these groups, 1 type of nonanoic acid (0.004%) with the highest proportion was identified, 1 type of Hexadecanoic acid ester, methyl ester (0.004%) with the highest proportion and 24 other types of compounds 2-Isoamyl-6-methylpyrazinel had the highest proportion (3.059%).

Table 2. Results of Volatile Compound Analysis of Vaname Shrimp Waste Broth

Golongan	RT (min)	Senyawa	Area	Proporsi
Hidrokarbon	19.8462	dimethylspiro[4.5]decane	1000111725	33.613
	22.6824	Cyclopropane, nonyl-	74663857	2.509
	16.3738	Cyclopentane, 1-pentyl-2-propyl-	62199513	2.090
	19.6143	Tridecane, 4-methyl-	26730121	0.898
	16.9743	2,6-Octadiene-1,8-diol, 2,6-dimethyl-	26489178	0.890
	31.9106	1-Nonadecene	18435455	0.620
	15.6721	Undecane, 2,6-dimethyl-	17301234	0.581
	15.6721	Undecane, 2,6-dimethyl-	17301234	0.581
	13.3889	2-Hexene, 3-methyl-, (Z)-	10574364	0.355
	17.3489	1-Methyl-2-methylenecyclohexane	2808755	0.094
	12.7348	Octane, 4-methyl-	2216344	0.074
	13.151	4-Nonene	2198234	0.074
	12.937	Cyclohexane, 1,2,3-trimethyl-	1678973	0.056
	15.8981	Cyclohexene, 1,2-dimethyl-	1674108	0.056
	12.2294	Cyclopentane, ethyl-	1640897	0.055
	19.7748	Tridecane, 2-methyl- cis,cis- and cis,trans-1,9-	1560969	0.052
	22.284	Undecane	1120214	0.038
	13.4959	Cyclopropane, 1,1-diethyl-	1003196	0.034

Golongan	RT (min)	Senyawa	Area	Proporsi
	13.4959	Cyclopropane, 1,1-diethyl-	1003196	0.034
	29.4489	Hentriacontane	630046	0.021
	30.0079	Nonadecane	629925	0.021
	20.7203	Tetradecane	629594	0.021
	18.0743	Tridecane	629505	0.021
	20.5597	Cyclotetradecane	295170	0.010
	14.5959	1-Nonene	124118	0.004
	15.2856	Dodecane	112403	0.004
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	14.9883	Naphthalene	91203	0.003
Alkohol	13.7754	(S)-(+)-6-Methyl-1-octanol	110453786	3.712
	14.4889	1-Pentanol, 2,4,4-trimethyl-	16325636	0.549
	23.5446	1-Dodecanol, 2-octyl-	5333426	0.179
	6.5688	2-Methylenecyclohexanol	4065809	0.137
	9.0424	1-Octen-3-ol	3391864	0.114
	17.2775	1-Undecanol	112425	0.004
	6.0931	1-Hexanol	111273	0.004
	10.4456	1-Hexanol, 2-ethyl-	104767	0.004
Aldehid	32.4814	Heptadecanal	1000376700	33.621
	14.2213	2-Nonenal, (E)-	18829566	0.633
	17.1645	2-Decenal, (E)-	3913813	0.132
	11.2543	2-Octenal, (E)-	2548870	0.086
	1.7467	Butanal, 3-methyl-	590863	0.020
	9.9164	2,4-Heptadienal, (E,E)-	431035	0.014
	30.4776	Tetradecanal	124254	0.004
	12.5862	Nonanal	124196	0.004
	9.6667	Octanal	124130	0.004
	10.8916	Benzeneacetaldehyde	122781	0.004
	15.5175	Decanal	112312	0.004

Golongan	RT (min)	Senyawa	Area	Proporsi
	6.8186	Heptanal	111717	0.004
	2.585	Pentanal	110623	0.004
	8.4834	Benzaldehyde	100527	0.003
Keton	20.863	Bicyclo[3.2.1]oct-3-en-2-one, 4-methyl-	62702890	2.107
	12.3781	3,5-Octadien-2-one, (E,E)-	30086023	1.011
	20.6489	1-Methyl-2-decalone	21102885	0.709
	21.4932	Tetrahydro[2,2']bifuranyl-5-one	19680003	0.661
	19.3111	3-Nonen-2-one	14309570	0.481
	22.5575	Cyclohexanone, 2-ethyl-	4423943	0.149
	22.1354	trans-Geranylacetone	3796701	0.128
	11.7002	Ethanone, 1-(1H-pyrrol-2-yl)-	1072839	0.036
	15.1548	2-Decanone	693549	0.023
	16.6116	2,3-Octanedione	585251	0.020
	17.9732	2-Undecanone	112129	0.004
Asam Organik	17.5273	Nonanoic acid	112050	0.004
Ester	32.6122	Hexadecanoic acid, methyl ester	112390	0.004
Lain-lain	16.8078	2-Isoamyl-6-methylpyrazine	91010412	3.059
	16.2727	4,8-Decadien-3-ol, 5,9-dimethyl-	67845549	2.280
	19.3705	1-(2-Pyrazinyl)butanone	61892817	2.080
	17.8008	Dihydrocarveole	38049262	1.279
	20.0424	Disulfide, di-tert-dodecyl	27458908	0.923
	21.9332	2,6-Dodecadien-1-al	21662135	0.728

Golongan	RT (min)	Senyawa	Area	Proporsi
	31.536	1-Butyl 2-isobutyl phthalate	17851535	0.600
	10.1542	Pyrazine, 2-ethenyl-6-methyl-	13925092	0.468
	11.9024	Pyrazine, 3-ethyl-2,5-dimethyl-	13360651	0.449
	21.8143	3,3'-Bis(1,2,4-oxadiazolyl)-5,5'-diamine	7627067	0.256
	7.1753	Pyrazine, 2,3-dimethyl-	5910894	0.199
	14.697	Levomenthol	2216515	0.074
	20.197	Benzimidazole, 2-amino-1-methyl-	1622577	0.055
	31.2862	Galoxolide	1222055	0.041
	4.3867	Silanediol, dimethyl-	1066428	0.036
	3.4472	1H-Pyrrole, 2-methyl-	636419	0.021
	7.6807	1H-Pyrrole, 1-ethyl-	617925	0.021
	18.3597	2-Acetylaniline	551939	0.019
	30.2873	2-Ethylhexyl salicylate	118605	0.004
	30.5668	Isopropyl myristate	110270	0.004
	3.8337	Pyrrole	109977	0.004
	17.7175	Benzenamine, N,N-diethyl-3-methyl-	91678	0.003
	21.404	Caryophyllene	87445	0.003
	33.4089	Butyl 2-ethylhexyl phthalate	85698	0.003

RT : *Retention Time* (minutes)

The hydrocarbon compound identified in the vaname shrimp waste broth sample is dimethylspiro [4.5] decane 33.613%. Dekana has 75 structural isomers, all of which are liquid and flammable and decane is a component of gasoline. The 1,7-di-iso-propylnaphthalene compound is included in the alkene hydrocarbons while dimethylspiro [4.5] decane includes alkane hydrocarbons.

Volatile compounds from hydrocarbons can be derived from the decarboxylation reaction and the process of separating the carbon chains of fatty acids and thermal oxidation from unsaturated fatty acids (Chung et al. 2002 in Pratama et al. 2018). According to Liu (2009). Some cyclic hydrocarbons identified in fish are the result of secondary reactions from thermal oxidation (heating) of carotenoids and other unsaturated fats.

From a chemical standpoint, alcohol is a chemical compound containing an -OH group attached to carbon atoms and hydrogen atoms and / or other carbon atoms. The compounds in the alcohol group identified were as many as 10 in meat broth samples and 8 in vaname shrimp waste broth samples. (S) - (+) - 6-Methyl-1-octanol has the highest proportion in both samples, which is 1.507% in meat samples and 3.712% in waste samples. The compound (S) - (+) - 6-Methyl-1-octanol identified in meat broth samples and vaname shrimp waste broth has a role as a plant metabolite and includes primary alcohol and has a pungent odor (NCBI 2019).

The compounds in the aldehyde group identified were 17 compounds in vaname shrimp meat broth samples and 14 compounds in vaname shrimp waste broth samples. The aldehyde group identified was Heptadecanal in both samples, with a proportion of 13,648% in samples of vaname shrimp meat broth and 33.662% in samples of vaname shrimp waste broth. According to Pratama et al. (2018), a group of volatile compounds arising from fats or fatty acids, namely aldehydes, are generally produced from various activities related to chemical reactions including enzymatic reactions and auto fat oxidation.

The compounds in the ketone group identified were 13 compounds in vaname shrimp meat broth samples and 11 compounds in vaname shrimp waste broth samples. The compound that was identified in the vaname shrimp meat broth sample was β-iso-Methyl ionone 13,646%. According to Cha et al. (1992), volatile compounds that occur in ketones are products of thermal oxidation or polyunsaturated fatty acid degradation. The β-iso-Methyl ionone compound is a light yellow colored liquid that has a fragrance odor (Lapczynski et al 2007).

The compound identified in the vaname shrimp waste broth sample is Bicyclo [3.2.1] oct-3-en-2-one, 4-methyl-2,107%. Generally, the ketone groups present in the sample are known to contribute to the sweet aroma of many crustaceans (Pratama et al. 2018). Bicyclo compound [3.2.1] oct-3-en-2-one, 4-methyl- is an olefinic compound and is derived from acrylic acid, commonly found in alcoholic beverages.

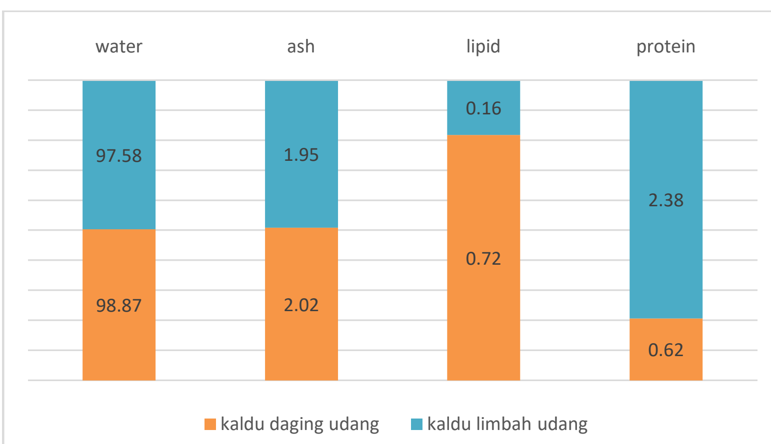
In addition to compounds from the hydrocarbon, aldehyde, alcohol and ketone groups, there were also several organic acids that were identified in both samples. Group of organic compounds identified were as many as 2 types in the sample of vaname shrimp meat broth and in the sample of vaname shrimp waste broth were identified 1 type. The compound that was identified in the sample of the broth is 0.555% Nonahexacontanoic acid vaname shrimp. The compound identified in the vaname shrimp waste sample was Nonanoic acid 0,004%. Nonanoic acid compounds or commonly called pelargonic acids include oily liquids with an unpleasant odor and rancidity, not easily dissolved in water (NCBI 2019).

The esters group identified in vaname shrimp meat broth samples are of 2 types, Oxalic acid, bis (6-ethyloct-3-yl) ester which has the highest proportion of 13.664%. The formation of esters or esterification can occur if carboxylic acids are heated with alcohol, based on their composition the esters are divided into three groups namely fruit juice, fat or oil, and wax (Anjasari 2015). The compounds identified in the sample of vaname shrimp waste broth are 1 type, Hexadecanoic acid, methyl ester with a proportion of 0.004%

Other compounds are usually identified because there are other factors apart from the sample, such as plants or from environmental factors around the waters and the place of sale of the shrimp itself. There are 31 other types of compounds identified in vaname shrimp meat broth samples. Epicedrol has the highest proportion of 13,645%. Epicedrol is a metabolite from plants (NCBI 2019). There were 24 species identified in the vaname shrimp waste broth sample. 2-Isoamyl-6-methylpyrazine has the highest proportion of 3.059%.

3.2 Proximate analysis

The proximate analysis provides general information about the chemical composition of the sample, nutrient content. The difference in results shows can be influenced by the composition of chemical raw materials, types of commodities processing stage (Pratama 2011). Proximate analysis consists of water content, ash content, fat content, and protein content. Proximate analysis of meat broth and vaname shrimp waste Figure 1.



Comment [rp2]: Fat ganti jadi lipid

Figure 1. Proximate analysis result of Meat Broth and Shrimp Waste

Water content is the main component making up the body of shrimp which is divided into two forms, namely free water and bound water. Free water can dissolve vitamins, mineral salts, and certain nitrogen compounds. Bound water is subdivided into several types such as chemically bound, physicochemical bound, and bound by capillary power (Jacoeb 2008). Water content is also one of the most important characteristics of food because water can affect the appearance, texture, and taste of food. Water content in food determines freshness and durability of these foodstuffs, high water content results in the ease of bacteria, mold, and yeast to multiply, so that changes will occur in food (Winarno 2008).

According to Pratama et al (2013), the ash content contained in a food is also influenced by several factors, such as the type of commodity, the growth phase, and environmental factors. Ash content of a food item indicates the presence of inorganic mineral content in the food material. Dayal et al. (2007)

minerals commonly contained in shrimp include calcium, magnesium, phosphorus, potassium, sodium, copper, iron, manganese, selenium, and zinc. These minerals will partially ignite at 550 °C so that when boiling at 65 °C does not have a significant effect on the ash content between boiled water / meat broth samples and vaname shrimp waste.

Lipid is one of the main ingredients in food. According to Jacoeb et al. (2008) lipid content is related to the flavor component because in the heating process the lipid will melt and will evaporate into the flavor component. Meat lipid content as much as 0.72% while fat content in waste as much as 0.16%, this proves that the protein content in meat is more than that of vaname shrimp waste. Lipids are one of the main sources of energy and contain essential lipids. The lipid component plays an important role that determines the physical characteristics of food such as aroma, texture, taste, and appearance if lipid is removed then one of the physical characteristics is lost (Sudarmadji et al. 1996).

Based on the results of the proximate analysis on vaname shrimp stew water samples, protein levels were obtained at 0.62% and on the vaname shrimp, waste boiled water samples protein levels were 2.38%. According to the broth BSN No. 01-4218 of 1996, the value of protein content that meets BSN is a minimum of 0.4%. This shows if the fat content of the two samples meets BSN. The higher the protein content, the better the quality, because protein content is the top priority in determining the best alternative for BSN value. This also proves that a lot of shrimp waste processing is used as an alternative food additive to the product.Various types of volatile compounds detected and identified fromthe sample are mostly derive from protein and lipid components,thus the types of volatile compounds are related to the sample's chemical compounds variability contained (Pratama et al 2018).Protein which is generally found in broth is a globular protein/spheroid protein. This protein is spherical, found in many foods such as milk, eggs, and meat. This protein dissolves in a solution of salt and dilute acid, and is also more susceptible to change under the influence of temperature, salt concentration, acidic solvents, and bases when compared to protein fibrils. This protein is easily denatured, that is, the composition of the molecule changes, followed by changes in physical and physiological properties as experienced by enzymes and hormones (Winarno 2008).

4. CONCLUSIONS

The group of compounds detected in meat and vaname shrimp waste is generally derived from aldehydes, alcohols, hydrocarbons, ketones, etc**.** The compounds that had the largest proportion in both samples were compounds of the 1,4-di-iso-propylnaphthalenee hydrocarbon group 13,648% for vaname shrimp meat broth and dimethylspiro [4.5] decane 33.613% for vaname shrimp waste broth. Proximate analysis results show that the vaname shrimp stew water sample has a moisture content of 98.87%, 2.02% ash content, 0.72% fat content, 0.62%

protein content, while the vaname shrimp waste boiled water sample has water content 97.58%, ash content 1.95%, fat content 0.16%, and protein content 2.38%.

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